REMARKS

By this amendment, Applicants have amended claim 2 to change the format of the claim and to recite that the combustion apparatus includes at least one blower for circulating combustion exhaust gas from an outlet of the furnace to an inlet of the flow path injecting a nitrogen oxide generation inhibiting gas, and for supplying the additional combustion air to the flow path injecting additional combustion air into the furnace. See, e.g., Figures 5, 6, 7 and 9 and the description thereof in Applicants' specification.

Claims 2, 4-11 and 13-16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,545,307 to Morita et al. in view of U.S. Patent No. 5,727,480 to Garcia-Mallol and U.S. Patent No. 4,135,874 to Tsuzi et al. Applicants traverse this rejection and request reconsideration thereof.

The present invention relates to a combustion apparatus including a burner burning a fuel within a furnace in a theoretical air ratio or less, an air port arranged downstream of the burner and separated into a flow path injecting additional combustion air into the furnace and a flow path injecting a nitrogen oxide generation inhibiting gas in a mixing region formed by both of a combustion gas generated by burning the fuel by means of the burner and the additional combustion air injected from the air port or near the mixing region. The nitrogen oxide generation inhibiting gas is constituted by at least one gas selected from a group consisting of the combustion exhaust gas and a mixed gas of the combustion exhaust gas and air. At least one blower is provided for circulating combustion exhaust gas from an outlet of the furnace to an inlet of the flow path injecting a nitrogen oxide generation inhibiting gas, and for supplying the additional combustion air to the flow path injecting additional combustion air into the furnace.

The Morita et al. patent discloses a coal combustion apparatus, which apparatus comprises a pulverized coal-feeding pipe inserted into a burner throat on the lateral wall of a combustion furnace and for feeding the coal and air into the furnace; a means for feeding the coal and air into the coal pipe; a secondary air passageway formed between the coal pipe and a secondary air-feeding pipe provided on the outer peripheral side of the coal pipe; a ternary air passageway formed on the outer peripheral side of the secondary air-feeding pipe; a means for feeding air or an oxygen-containing gas into the secondary air passageway and that into the ternary air passageway; and a bluff body having a cross-section of a L-letter form provided at the tip end of the coal pipe.

In the "Description of the Prior Art" section of Morita et al. from column 1, line 11 to column 2, line 44, the "two-stage" combustion process shown in Figure 1 is described (see, e.g., column 1, lines 43-56), the disadvantages of the two-stage combustion process are described (see, e.g., column 1, lines 57-63) and the "dual resistor type burner" used in place of controlling the combustion of the whole of boilers, i.e., in place of the two-stage combustion of Figure 1, is described (see, column 1, line 64 to column 2, line 44). From column 2, line 45 to the end of the Morita et al. patent, a modification of the dual resistor type burner is described and claimed. As applicants have previously noted, the disclosure of Morita et al. actually teaches away from the arrangement in Figure 1.

Moreover, as admitted by the Examiner, the Morita et al. patent, even in Figure 1, does not disclose the presently claimed invention, including an air port, the inner side of of which is separated into a flow path injecting additional combustion air, and a flow path injecting nitrogen oxide generation inhibiting gas.

Further, Morita, et al. relates to a burner supplying fuel such as the pulverized coal or the like, and is different from the present invention, which relates to a combustion apparatus including an air port arranged downstream of the burner and separated into a flow path injecting additional combustion air into the furnace and a flow path injecting a nitrogen oxide generation inhibiting gas in a mixing region formed by both of a combustion gas generated by burning the fuel by means of the burner and the additional combustion air injected from the air port or near the mixing region. For example, as shown in Figs. 5, 6, 7, and 9 of the present application, in some embodiments of the present invention, the flow path 43 from the fan 13 (25) for the combustion air is connected to the wind box 9 (regulating device 23) supplying the combustion air to the center of the after air, and the flow path 31 from the center of the after air, and the flow path 31 from the fan 15 (37) for the exhaust gas corresponding to the inhibiting gas is connected to the wind box 5 (regulating device 32) supplying the exhaust gas to the peripheral portion of the after air. The Morita, et al. patent does not disclose such a structure as shown in Figs. 5, 6, 7, and 9 of the present application or as set forth in claim 2.

In Garcia-Mallol, the secondary air flows out from the passages 28 and 30; however, air having the same composition and temperature flows out therefrom.

Thus, even assuming, arguendo, one of ordinary skill in the art would have used the two-stage combustion arrangement of Figure 1 of Morita et al. and combined it with the over-fire air control system of Garcia-Mallol, even the combination would not have rendered obvious the presently claimed invention. That is, even the combination of Morita et al. and Garcia-Mallol would not have rendered obvious the presently claimed

combustion apparatus including the presently claimed inhibiting gas supply means, the presently claimed blower and the use of a nitrogen oxide generation inhibiting gas constituted by at least one gas selected from a group consisting of the combustion exhaust gas and a mixed gas of the combustion exhaust gas and air.

More particularly, Garcia-Mallol describes that the damper 22a controls the amount of air circulating in the flow path 28, and the damper 22b controls the amount of air circulating in the flow path 30, as shown in Fig. 1 and described in the relevant description. However, since the two dampers are within the same duct 24 and only the secondary air enters into the duct 24, only the secondary air is distributed. In other words, fluid having the same composition flows to the flow paths from two dampers, and the fluid is the secondary air. The fact that the secondary air is the combustion air is particularly based on the description in line 66, column 3, to line 22, column 4 of Garcia-Mallol.

On the other hand, in the present invention, the nitrogen oxide generation inhibiting gas is the combustion exhaust gas or a mixed gas of the combustion exhaust gas and air, the combustion exhaust gas being circulated from furnace to the inhibiting gas supply means by a blower. Accordingly, the present invention is different from Garcia-Mallol alone or in combination with Morita et al.

Thus, the proposed combination of Morita et al. and Garcia-Mallol does not render obvious the presently claimed invention.

The Tsuzi et al patent discloses a furnace whose NOx emission may be reduced by optimally controlling the ratio of exhaust gas mixed with the combustion air to be supplied to the burners to the exhaust gas to be mixed with the two-stage combustion

air which is admitted through air nozzles into the combustion chamber and also by optimally controlling the distribution of the two-stage combustion air in the combustion chamber depending upon the operating conditions.

However, in Tsuzi et al, it appears a single mixture gas is introduced through each two-stage combustion air injection nozzle. This type of arrangement may suffer from the deficiency described at page 5, lines 17-23 of applicants' specification, i.e., that it may be necessary to supply a lot of exhaust gas or low-temperature air for lowering the temperature of the high-temperature combustion gas in the upper portion of the burner within the furnace. Accordingly, a power generation efficiency of the plant may be significantly reduced.

On the other hand, air port arranged downstream of the burner of the present invention is separated into a flow path injecting additional combustion air into the furnace and a flow path injecting a nitrogen oxide generation inhibiting gas in the mixing region. This is not disclosed by Tsuzi et al. Accordingly, the Tsuzi et al patent does not remedy the deficiencies noted above with respect to the proposed combination of Morita et al. and Garcia-Mallol.

Therefore, the presently claimed invention is patentable over the proposed combination of Morita et al., Garcia-Mallol and Tsuzi et al.

Claim 12 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Morita et al. in view of Garcia-Mallol and Tsuzi et al. and U.S. Patent No. 5,231,937 to Kobayashi et al. Applicants traverse this rejection and request reconsideration thereof.

The Kobayashi et al. patent has been cited by the Examiner as allegedly teaching that is known to lower the temperature of an exhaust gas by means of a heat

exchanger. However, since claim 12 ultimately depends from claim 2, it is submitted claim 12 is patentable at least for the reasons noted above with respect to claim 2.

In view of the foregoing amendments and remarks, favorable reconsideration and allowance of all of the claims now in the application are requested.

Please charge any shortage in the fees due in connection with the filing of this paper, including excess claim fees, to Deposit Account No. 01-2135 (500.45104X00), and please credit any excess fees to such deposit account.

Respectfully submitted,
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